PATENT SPECIFICATION 585,799

Convention Date (United States of America): April 15, 1942.

Application Date (in United Kingdom): May 19, 1943. No. 7962/43.

Complete Specification Accepted: Feb. 25, 1947.

COMPLETE SPECIFICATION

Improvements in or relating to the Manufacture of Shortenings and Food Compositions produced therewith

I, ILONA TAUSSKY, 124, East 24th Street, New York, United States of America, a former citizen of Austria, first papers of United States Citizenship, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to shortenings comprising one or more fats or fatty oils, and to food compositions produced therewith, and it involves the use of liquid jojoba nut oil, in regard to which reference is directed to Jamieson's "Vegetable Fats and Oils," 2nd. ed., 1943, pages 88 and 89, and to Hilditch's "The Chemical Constitution of Natural Fats," 1940. On page 360 of the latter publication the jojoba plant is referred to botanically as "Simmondsia californica," and the nut is also known in some localities as the pig, sheep, goat and quinine nut. The oil is obtainable in the liquid or "unhardened" state or in the wax-like or "hardened" state.

The main object of my invention is to provide new and improved shortenings and food compositions produced therewith, particularly baked flour compositions such as cakes.

A further object of my invention is to provide methods or processes for producing the above products and compositions.

Liquid jojoba nut oil, as obtained by chemical extraction or mechanical crushing from the nuts of the jojoba plant (Simmondsia Californica), is, owing to its non-glyceridic nature, not very suitable for use in food destined for human consumption, except when blended with a relatively large percentage of other glyceridic and thus more readily digestible oils and fats.

I have, however, discovered that liquid jojoba nut oil can be hydrogenated or elaidinated, particularly by the processes described below in detail, and it is possible to saponify the liquid, elaidinated or hydrogenated jojoba nut oil and to separate the saponified fatty acids from the unsaponifiable alcohols. Thus I am able to obtain unhardened, elaidinated and hydrogenated jojoba nut alcohols.

As used in the present specification the term "saponified jojoba nut fatty acids" means the saponified matter obtained when jojoba nut oil is treated with a saponifying agent. The term "saponified unhardened jojoba nut fatty acids" is used for the saponified matter obtained in the same way from liquid jojoba nut oil, "saponified elaidinated jojoba nut fatty acids" for the saponified matter from elaidinated jojoba nut oil, and "saponified hydrogenated jojoba nut fatty acids" for the saponified matter from hydrogenated jojoba nut oil. Furthermore the expression "jojoba nut alcohol" stands for the unsaponifiable matter obtained when jojoba nut oil is treated with a saponifying agent and which may be separated for example by distillation; this unsaponifiable portion consists substantially exclusively of alcohols, but apparently contains no glycerol. Also the term "unhardened jojoba nut alcohol" signifies the unsaponifiable matter obtained in the same way from liquid jojoba nut oil, the term 'elaidinated jojoba nut alcohol" the unsaponifiable matter from elaidinated jojoba nut oil, while "hydrogenated jojoba nut alcohol" means the unsaponifiable matter from jojoba nut oil.

As indicated above, one of the main objects of the present invention is to provide new and improved shortenings for baking purposes. It is well known that baked flour compositions are produced from dough containing shortenings and water, in addition to flour, sugar, baking powder etc. All these ingredients are intimately mixed to form a creamy emulsion including the maximum of air and water. Thus during the production of baked flour compositions the dough is really an emulsion (see "Industrial Oil and Fat Products" by Alton E. Bailey,

pp. 284-287), and in the formation of this emulsion the shortenings play a very important part.

The improved shortenings according to this invention have great emulsifying powers, and such shortening materials are greatly needed, as the regular shortenings, usually made of hydrogenated cotton seed, soya bean or like oils, are substantially lacking in emulsifying power. The improved shortenings according to one form of the present invention comprise one or more fats or fatty oils mixed with a small proportion of jojoba nut alcohol or of elaidinated or hydrogenated jojoba nut alcohol.

The jojoba nut alcohol desirably forms only about 1% to 20% of the ingredients of the shortening. Thus, a preferred shortening composition according to my present invention consists mainly of a hydrogenated vegetable oil of the type used up to now for shortening purposes and of about 1% to 20%, preferably between 5% to 10%, of jojoba nut alcohol or of elaidinated or hydrogenated jojoba nut alcohol. Instead of mixing the usual hydrogenated vegetable oil shortening with hydrogenated jojoba nut alcohol, the unhydrogenated vegetable oil may be mixed with jojoba nut alcohol and subjected to the process of hydrogenation after mixing.

The improved shortenings according to another form of the present invention comprise one or more fats or fatty oils mixed with a small proportion of jojoba nut oil or of elaidinated or hydrogenated jojoba nut oil. Alternatively, the improved shortenings may contain more than one of the jojoba nut oils and/or jojoba nut alcohols which have been mentioned.

It should be stressed that, as stated above, jojoba nut oil can be subjected to the process of elaidination. This process, when it precedes saponification, greatly facilitates the separation of the saponified fatty acids from the unsaponifiable alcohol; furthermore, it also increases not only the emulsifying power of the unsaponified oil itself but also that of the alcohol obtained by saponification of the oil. Thus, the elaidination may have a double advantage, namely to facilitate the process of separating saponified fatty acids from unsaponifiable alcohols and simultaneously to increase the emulsifying power of the alcohols.

The normal processes of hydrogenation, of separation of the saponified fatty acids from the alcohol, and of elaidination, as used for other vegetable and marine oils, such as castor oil, rapeseed oil and sperm oil, may be used in carrying the invention into practice, (the normal elaidination practice is described in " Industrial Oil and Fat Products " by Alton E. Bailey, page 21 in connection with the elaidination of oleic acid), and no further description thereof need be given herein. However I have found that the invention may advantageously be carried into practice as described below in detail.

A preferred way to separate the saponified jojoba nut fatty acids from the jojoba nut alcohol consists in mixing the liquid, elaidinated or hydrogenated jojoba nut oil with 35 to 50 Be. sodium hydroxide solution in 10% excess of that needed for full saponification of the oil, 0.1% of tetrasodium pyrophosphate dissolved in double its weight of hot water, and ½% of calcium carbonate suspended in water. The reaction vessel is a vessel of the type commonly used for fatty acid distillation, but filled only up to ¼ of its total capacity with oil, whilst a normal distillation vessel can be charged up to ½ of the total capacity. A scrape type mechanical stirrer provides better mixing of the soap and prevents local overheating. Initially, the temperature is maintained below 210 degrees F. After about two hours, the whole mixed mass acquires a homogeneous appearance. As soon as the water which was added sparingly in the alkaline solutions starts to evaporate, a vacuum of maximum 26 inches Hg is created and the heat is increased by commencing distillation with superheated steam. The amount and temperature of this steam must be regulated so as to prevent overflow of the mass and too rapid rising of the temperature, preferably in such a way that the temperature of the mixture rises to about 400 to 500 degrees F. in about 2 to 3 hours. At this temperature, the danger of overflow is practically ended and the heating can be continued more rapidly by increasing the rate of steam flow. Simultaneously, the vacuum may be intensified to 29¼ inches Hg. At about 500 degrees F. the jojoba nut alcohol, becomes separated from the saponifiable portion of the oil and distils off, while the latter remains as residue in fully saponified state.

This residue, namely the saponified jojoba nut fatty acids, constitutes a useful by-product of the process according to the invention since it forms a hard soap which can easily be powderized, even if unhardened liquid or elaidinated jojoba nut oil has been used as starting material. By dissolving the saponified jojoba nut fatty acids in hot water a jelly-like compound is obtained.

The fatty acids contained in the residue can be separated from the soap in known

manner by splitting, preferably with aid of a mineral acid. These fatty acids can be purified by bleaching or distillation. New preparations are obtained from these purified high molecular fatty acids either by esterification with glycerol or with glycol, or by making metal soaps. These metal soaps are of special interest in varnish compositions and show new properties as compared with the metal soaps made from stearic or palmitic acids.

The distillate, i.e. the unsaponifiable jojoba nut alcohol, is washed several times with boiling water, dried, and then bleached with activated earth. This distillate can also be redistilled to improve its purity or steamed under vacuum with superheated steam below the distillation point. The hydrogenation process mentioned above may be carried out by mixing jojoba nut oil with 0.1% activated nickel catalyst, 0.2% kieselguhr, and 0.5% carbon, stirring this mixture, heating it under vacuum, which is built up to 29¼ inches H*g* of vacuum, up to about 200° F. and then putting it under hydrogen pressure of about 50 pounds/sq.in. or higher pressures up to about 300 pound/sq.in. for about 2 to 5 hours. Then, the thus treated oil is cooled under hydrogen pressure of 5 to 10 pounds/sq.in. or under vacuum of 29¼ inches H*g*, filtered from the catalyst and refiltered with the addition of activated earth. The thus obtained hydrogenated jojoba nut oil is a crystalline wax-like product which can be treated as stated above, i.e. either subjected to saponification or used without further treatment.

I have found it of importance to refine, i.e. clean, the liquid oil before hydrogenation or elaidination as this makes the hydrogenation or elaidination process more rapid and economical. This cleaning and refining can be carried out by treating the jojoba nut oil first with concentrated salt water, thereby removing impurities, and then washing the oil with a weak alkaline solution. This latter treatment is advantageously carried out at a temperature near the boiling point of water. Thereafter, the added cleaning agents, together with the impurities, are removed either by settling or centrifugally.

In some cases, it is also advantageous to subject the hydrogenated or elaidinated jojoba nut oil to a process of neutralization and bleaching in order to improve its stability, its odor and color, and to obtain a high smoke point. The bleaching is carried out with activated earth under vacuum at elevated temperature; thereafter, if required, the bleached hydrogenated or elaidinated oil may be deodorized under vacuum with superheated steam at a temperature below 400 degrees F. By this deodorization treatment high stability is obtained and the smoke point is substantially raised.

As mentioned above, the process of elaidination greatly facilitates saponification of the unhardened jojoba nut oil; after saponification of such elaidinated jojoba nut oil the components obtained, namely the elaidinated jojoba nut fatty acids and the elaidinated jojoba nut alcohol, may be subjected to hydrogenation if required. It is also possible to facilitate saponification by subjecting only a part of the liquid jojoba nut oil to elaidination, to mix the thus produced elaidinated jojoba nut oil with untreated liquid jojoba nut oil, to subject this mixture to hydrogenation, and then to saponify it; saponification of liquid unhardened or hydrogenated hardened jojoba nut oil can also be facilitated by adding a relatively small amount of elaidinated oil to it before subjecting it to saponification.

I have found that saponification of liquid jojoba nut oil can also be hastened by emulsifying the oil with some saponified substance, e.g. soap, before saponification; for this purpose, I preferably use a relatively small amount of saponified jojoba nut fatty acids obtained by a previous process.

Shortening compositions may be produced in various ways. Thus, for instance, it is possible to produce a shortening by mixing unhardened, elaidinated or hydrogenated jojoba nut alcohol prepared as previously described with normal hydrogenated cotton seed oil which is used as a regular shortening. The jojoba nut alcohol should be about 1% to 20%, preferably 5% to 10% of the shortening composition. After mixing, this shortening composition is deodorized, first under vacuum and then with dry or superheated steam at a temperature of about 350 to 400 degrees F. After cooling and chilling, the finished shortening composition has an excellent stability towards oxidation and results in a batter without curdling when used for baking purposes. Cakes baked with such a shortening composition have a fair volume and fine texture.

Another way of producing shortenings consists in mixing about 5% to 10% of liquid jojoba nut alcohol with about 95% to 90% of cotton seed or soya bean oil and hydrogenating this mixture. The hydrogenated product serving as shortening after cleaning and deodorizing has an excellent stability toward rancidity and oxidation. Shortening compositions produced as described above are very well

adapted not only for use in baking but may also be incorporated in compositions such as batter used for frying.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. Method of producing an improved shortening for use in making cake batter or other food compositions, having increased emulsifying power, characterised by incorporating in one or more fats or fatty oils a small proportion of untreated, elaidinated or hydrogenated jojoba nut oil, or untreated, elaidinated or hydrogenated jojoba nut alcohol or any mixture of these jojoba nut products.

2. Method of producing an improved shortening, according to Claim 1, comprising incorporating into said fats or fatty oils about one to twenty per cent. of jojoba nut alcohol.

3. Method of preparing elaidinated jojoba nut alcohol comprising the steps of first elaidinating liquid jojoba nut oil, then saponifying the elaidinated jojoba nut oil and finally distilling, thereby obtaining the unsaponifiable elaidinated jojoba nut alcohol separated from the saponified elaidinated jojoba nut fatty acids.

4. In the method claimed in Claim 3, the step of mixing unhardened jojoba nut oil with the elaidinated jojoba nut oil and then hydrogenating the mixture before saponifying.

5. Method according to Claim 3 or 4 in which the elaidinated jojoba nut oil is saponified with sodium hydroxide solution mixed with a little tetrasodium pyrophosphate and calcium carbonate.

6. Method of preparing jojoba nut alcohol comprising the steps of first emulsifying jojoba nut oil with a relatively small amount of saponified jojoba nut fatty acids, then saponifying the emulsion and finally distilling.

7. Shortenings when produced by the methods according to Claims 1 or 2.

8. Methods of producing an improved shortening for use in making food compositions, having increased emulsifying power, substantially as herein described.

9. Food compositions having incorporated therein a shortening when produced by any of the methods or processes substantially as herein described.

Dated this 19th day of May, 1943.

CHARLES S. PARSONS,
B.Sc., A.M.I.E.E.,
Chartered Patent Agent,
Thanet House, 231, Strand, London, W.C.2,
Agent for the Applicant.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1947.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 1s. 0d. each (inland) 1s. 1d. (abroad) may be obtained.